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EXAMINER	
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ART UNIT	PAPER NUMBER
2133	

DATE MAILED: 01/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/808,325	ILLMAN, RICHARD	
	Examin r	Art Unit	
	Marshall S Eng	2133	

-- Th MAILING DATE of this communication app ars on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 October 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1.1 Applicant's arguments, filed 7 October 2003, with respect to the rejection(s)of claim(s) 1 and 6 under 35 USC 103 and 3 and 4 under 35 USC 112 2nd have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made below.

1.2 Objections to the drawings and specifications not stated below have been met and therefore withdrawn.

Drawings

2.1 The drawings are objected to because, as noted in the Office Action mailed 7 July 2003, Figures 2a and 2c still contain references denoting step numbers that are not legible. Specifically, steps 10 and 12 in Figure 2a and steps 18 and 20 of Figure 2c.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3.1 The disclosure is objected to because, as noted in the Office Action mailed 7 July 2003, of the following informalities: the phrase "N times" on line 6 of page 3 of the substitute specifications filed 7 October 2003 should apparently be changed to "M times."

3.2 The disclosure is further objected to because, as noted in the Office Action mailed 7 July 2003, of the following informalities: the phrase "G sub N+1" on line 13 of

page 5 of the substitute specifications filed 7 October 2003 should apparently be changed to "G sub N-1."

Appropriate corrections are required.

Claim Objections

4.1 Claim 1 is objected to because of the following informalities: the phrase "N times" in step g) should apparently be "M times."

4.2 Claim 6 is objected to because of the following informalities: the phrase "M+1 times" should apparently be "M times" and the phrase "values M to 0" should apparently be "values M to 1."

4.3 Claim 1 is objected to because of the following informalities: the term "random" when describing the selection of faults should be changed to reflect that the faults are selected based upon an equation/probability. From the specifications, it is clear that the probability of a given fault being selected is based on an equation (i.e. X^-N) and not necessarily at "random." Further the idea of randomness is more of an abstract idea/concept that can never be fully achieved (hence pseudo randomness).

Appropriate correction is required.

Claim Rejections - 35 USC § 103

5.1 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5.2 Claim(s) 1-7 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Pomeranz et al. "On Static Compaction of Test Sequences for Synchronous Sequential Circuits" (1996) (hereinafter Pomeranz) in view of Smith et al. "System Dependability Evaluation via a Fault List Generation Algorithm" (1996) (hereinafter Smith).

As per claim 1,

Pomeranz substantially teaches of an initial set of test vectors (i.e. test set), see column 2 on page 215, of an original fault list (i.e. the set of target faults), see column 1 on page 216, of simulating a vector set against a fault list, see step 3 of procedure 3 on column 2 on page 217, and of removing redundant or duplicate vectors from the vector set, see column 2 on page 217. Further, Pomeranz teaches of repeated compaction through fault simulation, see procedure 3 starting in column 2 of page 217.

Pomeranz does not teach of selecting the faults at random from the original fault list. Nonetheless, Pomeranz does teach of static compaction of the test sets so as to have shorter test application times and smaller memory requirements, see Abstract of column 1 on page 215.

Smith, in an analogous art, teaches of randomly selecting faults from an initial fault list, see Introduction in columns 1 and 2 of page 974. While not explicitly teaching of using the randomly selected faults to simulate test vectors against, Smith does indeed teach of using the randomly selected faults to see if "the system properly handles faults." This is being interpreted to mean that if the system were to handle the fault properly, the fault would be detected/detectable by a test vector from a test vector set.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the static compaction method of Pomeranz to include the random fault selecting teachings of Smith. This modification would have been obvious because one of ordinary skill in the art would have been motivated by the suggestion provided by Smith that selecting faults at random from the total fault space of the system is a typical method used in fault list generation (and fault injection), see column 2 paragraph 1 under Background Theory on page 974.

One of ordinary skill in the art would then easily be able repeatedly simulate Pomeranz's test vector set (minus redundant/duplicate vectors) against Smith's randomly selected fault list. Further, it would have been obvious to one of ordinary skill in the art to limit the number of repeated fault simulations. Since the purpose of compaction is to shorten test application times, one skilled in the art would want to cap (or limit) the number of times this process is repeated so as to not cause the compaction time to be too long, thereby wasting the time saved from the compacted vector set.

As per claim 2,

It would have been further obvious to one of ordinary skill in the art to limit the number of repeated fault simulations. Since the purpose of compaction is to shorten test application times, one skilled in the art would want to cap (or limit) the number of times this process is repeated so as to not cause the compaction time to be too long. If endless repetition were allowed, the time that application time that would have been

saved by the now compacted vector set would be lost due to the extended (i.e. endless) time used by the repetition.

Further, it is disclosed that decision to repeat the process a number of times other than 10 would result in an effect on the time taken to test the circuit. While not being explicitly obvious to one of ordinary skill in the art to choose the number of repetitions to be exactly 10, one of ordinary skill would clearly be able to choose any integer value as the number of repetitions and then apply the same argument. For example, if one skilled in the art were to choose 20 repetitions, it is necessarily obvious that more or less repetitions would result in effecting the time taken to test the circuit.

Still further, no explanation of the relevance or specific advantage that is gained by repeating the process exactly 10 times is given. Furthermore, one of ordinary skill in the art would have expected the method to perform equally as well with any number of repetitions (whether fewer or greater than 10) because the number of repetitions simply limits the number of times the steps are repeated.

As per claims 3-4,

Smith further teaches of randomly selecting faults from an initial fault list, see Introduction in columns 1 and 2 of page 974.

While not explicitly taught that the equation "X^-n" is used to determine the probability of selecting faults from an initial/original fault list, it would have been obvious to one of ordinary skill in the art to use one of many basic probability equations to determine the probability of a fault being in a subset. The specifications do not disclose the relevance of using or of any specific advantage that is gained by selecting the

specific probability equation "X^-n." Furthermore, one of ordinary skill in the art would have expected the method to perform equally well with any number of probability equations because all probability equations calculate a probability of something happening. Equations such as 1/N, 2/(X^N), and any variations of them all produce a probability based on the iteration (repetition) stage (N) that the method is in.

As per claim 5,

It would have further been obvious to one of ordinary skill in the art to set the variable X to equal 2. The specifications do not disclose the relevance of using or of any specific advantage that is gained by selecting the specific value of X to equal 2. Furthermore, one of ordinary skill in the art would have expected the method to perform equally well with any number of values for X because no matter the what the value of X is, the probability equation would still return a probability value.

Further, one of ordinary skill in the art would clearly know that having values less than 2 would necessarily make the subset large by increasing the probability of a fault being included and having values greater than 2 would necessarily make the subset smaller by reducing the probability of a fault being included. These are basic and fundamental properties of exponents. Therefore, if one skilled in the art were to choose the value of the variable X to be 5, similar arguments would follow that making $X < 5$ would increase the probability of a fault being include and making $X > 5$ would decrease the probability of a fault being included.

As per claim 6,

Pomeranz further teaches of repeated simulation of a vector set against an undetected fault list, see procedure 3 starting in column 2 of page 217. While Pomeranz does not explicitly teach of saving the list of undetected faults, Pomeranz does teach of simulating only the undetected faults, see procedure 3 starting in column 2 of page 217. Essentially, simulating the undetected faults only is equivalent to saving the undetected faults and then simulating. To simulate the undetected faults only, one skilled in the art has to either delete or ignore previously detected faults.

Further it would have been obvious to one of ordinary skill in the art to remove/delete/omit any vector that does not detect any faults. Since the purpose of compaction is to require less time and memory during testing, it would have been obvious to remove a vector that does not detect any faults, thereby requiring one less vector to be tested (saving time) and stored (saving memory).

Further, while not explicitly teaching of repeating the process M+1 times, Pomeranz does teach of repeated simulation of a vector set against an undetected fault list, see procedure 3 starting in column 2 of page 217. As similarly stated above in claim 2, it would have been further obvious to one of ordinary skill in the art to limit the number of repeated fault simulations. Since the purpose of compaction is to shorten test application times, one skilled in the art would want to cap (or limit) the number of times this process is repeated so as to not cause the compaction time to be too long. If endless repetition were allowed, the application time that would have been saved by the now compacted vector set would be lost due to the extended time used by the repetition.

Still further, it would have been obvious to one of ordinary skill in the art to simulate all test vector sets in order to remove all duplicate/redundant vectors thereby compacting the test vector set (i.e. repeat the simulation and deletion of duplicate vectors).

As per claim 7,

It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement a text search to help in the removal of duplicate patterns. Text searches are well known and widely used as basic search strategies. Further, once a duplicate string is found, it would have been obvious to delete it since the purpose of the method of compaction is to reduce the time and memory required to run the test set. Clearly, removing a duplicate vector would reduce the number of vectors in the set therefore reducing the size and amount of time needed to simulate it.

Conclusion

6.1 The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Arlat et al. "Fault Injection for dependability validation of fault-tolerant computing systems"

b. Chang et al. "Test set compaction for combinational circuits"

c. Kajihara et al. "One compacting test sets by addition and removal of test vectors"

d. Pomeranz et al. "Static Compaction for two-pattern test sets"

e. Pomeranz et al. "Dynamic test compaction for synchronous sequential circuits using static compaction techniques"

f. Pomeranz et al. "An approach for improving the levels of compaction achieved by vector omission"

g. Hsiao et al. "Fast static compaction algorithms for sequential circuit test vectors"

6.2 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marshall S Eng whose telephone number is (703) 305-4638. The examiner can normally be reached on M-Th, 9 am to 5:30 pm and F 9 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

mse

Albert DeCady
Primary Examiner